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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,177	10/20/2003	Juanita DeLoach	TI 35986	2711

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EXAMINER	
WILCZEWSKI, MARY A	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 10/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/689,177	DELOACH ET AL.	
	Examiner	Art Unit	
	M. Wilczewski	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *July 6, 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Office action is in response to the Request For Reconsideration filed on July 6, 2006.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, and 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 6,093,621), of record, in view of Nagarajan (Pub. No. US 2002/0166838), newly cited.

Tseng discloses forming an opening in a substrate (100) through a patterned photoresist layer (106) and a hardmask layer comprising silicon nitride (104) located over the substrate with a plasma (Fig. 1A-1B, col. 2, lines 1-6 and 38-55). Tseng teaches trimming the photoresist layer with a plasma to create an exposed portion of the hardmask layer (Fig. 1C and col. 2, lines 1-10 and col. 3, lines 1-5). Tseng shows removing the exposed portion of the hardmask with a plasma to create a trench guide opening (Fig. 1D). Tseng discloses that while the exposed portion of the hardmask is removed, the trench 108 is further etched *consequently*. Tseng does not teach to create a trench through the trench guide *after removing the exposed portion of the hardmask layer*. However, Nagarajan teach a method of forming a deep trench in a

substrate by a method which includes the steps of enlarging the size of an opening in a photoresist mask and then performing a vertical etching step to extend the depth of the trench (¶¶ [0036] and [0037]). In light of the teaching of Nagarajan, it would have been obvious to one skilled in the art that the depth of the trench formed in the known method of Tseng could have been extended by etching after removal of the exposed portion of the hardmask. Tseng also teaches forming an oxide liner in the trench, depositing an oxide in the trench to form an isolation structure, and removing the hardmask (F. 1E-1H, col. 3, lines 19-42).

Claims 2, 4, and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 6,093,621), of record, in view of Nagarajan (Pub. No. US 2002/0166838), newly cited as applied to claim 1 above, and further in view of Miller (US 6,287,974).

Tseng and Nagarajan are applied as above. Tseng lacks anticipation of patterning the opening through a bottom anti-reflective coating (BARC) layer located between the photoresist and the hardmask layer. Tseng also lacks anticipation of performing the trimming, creating and removing in the same plasma tool, the source power, the bias power, and the flow rate, as claimed. Miller teaches a bottom anti-reflective coating (BARC) layer may be disposed between the nitride layer and the photoresist layer to help the transfer of critical dimensions from the photoresist onto the nitride layer (col. 10, lines 54-60). Miller shows employing the same plasma tool (col. 4, lines 38-46,; col. 6, lines 10-15; and col. 8, lines 25-28). Miller discloses using gases including HBr, O_2,

and Ar, a flow rate from 0 sccm to 100 sccm, and a power within the claimed range (col. 8, lines 40-63 and col. 9, lines 25-30).

It would have been obvious to one skilled in the art to use a BARC layer in the known method of Tseng, since a BARC layer enables the accurate transfer of critical dimensions from the photoresist onto the nitride layer. It would have been obvious to the skilled artisan to employ the same plasma tool and to use the disclosed etching technique of Miller in the known method of Tseng, since these enable the formation of a trench of presice dimensions in a substrate. Moreover, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular claimed processing parameters because applicant has not disclosed that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using other flow rates and powers. Moreover, it has been held that limitations directed to these particular processing parameters are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 6,093,621), of record, in view of Nagarajan (Pub. No. US 2002/0166838), newly

cited, as applied to claim 1 above, and further in view of Kadosh et al. (US 5,770,483), of record.

Claims 11, 13, 15-17, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 6,093,621), of record, in view of Nagarajan (Pub. No. US 2002/0166838), newly cited, further in view of Kadosh et al. (US 5,770,483), of record.

Tseng and Nagarajan are applied as above. Tseng does not show forming transistors on the active regions and forming interconnects over the transistors to form an operative integrated circuit. However, Tseng discloses a method of forming an integrated circuit and, more particularly, a method of forming a shallow trench isolation structure (col. 1, lines 5-8). Tseng discloses that after fabricating the shallow trench isolation structure, it is conventional to fabricate a transistor on the active region (col. 1, lines 23-42).

Kadosh et al. teach forming trench isolation structures between active regions (Figs. 1, 3, and 7; col. 4, lines 43-65). Kadosh et al. show forming transistors on the active regions including forming wells and source/drain regions, and forming interconnects over the transistors to form an operative integrated circuit (abstract; Fig. 7-9; col.1, lines 22-32; col. 3, lines 4-15; col. 5, lines 1-10; and col. 6, lines 5-50). Therefore, it would have been obvious to the skilled artisan to modify the Tseng reference by including interconnects over transistors to fabricate operative integrated circuits, as taught by Kadosh et al., in order to obtain a multilevel transistor having high performance interconnections and shallow trench isolation without damaging the substrate (Kadosh et al., abstract; Tseng, col. 1, lines 5-8 and 65-67).

Claims 12, 14, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 6,093,621), of record, in view of Nagarajan (Pub. No. US 2002/0166838), newly cited, further in view of Kadosh et al. (US 5,770,483), of record, as applied to claim 11 above, and further in view of Miller (US 6,287,974).

Tseng, Nagarajan, and Kadosh et al. are applied as above. Tseng lacks anticipation of patterning the opening through a bottom anti-reflective coating (BARC) layer located between the photoresist and the hardmask layer. Tseng also lacks anticipation of performing the trimming, creating and removing in the same plasma tool, the source power, the bias power, and the flow rate, as claimed. Miller teaches a bottom anti-reflective coating (BARC) layer may be disposed between the nitride layer and the photoresist layer to help the transfer of critical dimensions from the photoresist onto the nitride layer (col. 10, lines 54-60). Miller shows employing the same plasma tool (col. 4, lines 38-46,; col. 6, lines 10-15; and col. 8, lines 25-28). Miller discloses using gases including HBr, O_2, and Ar, a flow rate from 0 sccm to 100 sccm, and a power within the claimed range (col. 8, lines 40-63 and col. 9, lines 25-30).

It would have been obvious to one skilled in the art to use a BARC layer in the known method of Tseng, since a BARC layer enables the accurate transfer of critical dimensions from the photoresist onto the nitride layer. It would have been obvious to the skilled artisan to employ the same plasma tool and to use the disclosed etching technique of Miller in the known method of Tseng, since these enable the formation of a trench of presice dimensions in a substrate. Moreover, it would have been an obvious

matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular claimed processing parameters because applicant has not disclosed that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using other flow rates and powers. Moreover, it has been held that limitations directed to these particular processing parameters are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical.

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited references disclose various methods of forming trenches in a substrate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Wilczewski whose telephone number is (571) 272-1849. The examiner can normally be reached on Monday -Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

M. Wilczewski
Primary Examiner
Tech Center 2800